

ABSTRACT

A component (10) having a thermal barrier coating (14) exhibiting an improved resistance to thermal shock. A plurality of stress relieving cracks (22) are formed at the free surface (24) of the thermal barrier coating as a result of the expansion of an inclusion (20) having a higher coefficient of thermal expansion than that of the surrounding matrix material (16). The inclusions function as crack initiators during the fabrication process as well as crack arrestors preventing the propagation of the cracks farther into the matrix material. The inclusion material may be selected to have an evaporation temperature that is less than the peak matrix material processing temperature, wherein the inclusion material will evaporate to leave a plurality of voids (30). In one embodiment, a superalloy substrate (12) is coated with a ceramic thermal barrier coating material having a plurality of spherical polymer inclusions disposed below its free surface. When the ceramic material is heated to its sintering temperature, the polymer inclusions induce cracks in the ceramic material through which the polymer then diffuses upon its subsequent evaporation.